



TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER

1788/00028

U.S. APPLICATION NO. (If known, see 37 CFR 1.51) **09/857106**

INTERNATIONAL APPLICATION NO.

PCT/FR00/02709

INTERNATIONAL FILING DATE

29 September 2000

PRIORITY DATE CLAIMED

1 October 1999

TITLE OF INVENTION

TORQUE CONTROL SYSTEM OF PARALLEL HYBRID POWERING

APPLICANT(S) FOR DO/EO/US

VACHER, Cécile

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:


1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. § 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the Annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter
16. ☒ Other items or information:

Copy of the International Search Report

PCT/FR00/02709

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/857106		INTERNATIONAL APPLICATION NO. PCT/FR00/02709		ATTORNEY'S DOCKET NUMBER 1788/00028			
<input checked="" type="checkbox"/> The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO.....\$860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482)\$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....\$100.00				CALCULATIONS		PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$860.00			
Surcharge of \$130.00 for furnishing the oath or declaration later than <input checked="" type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$130.00			
Claims	Number Filed	Number Extra	Rate				
Total Claims	4 - 20 =	0	X \$18.00	\$0.00			
Independent Claims	1 - 3 =	0	X \$80.00	\$0.00			
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$0.00			
TOTAL OF ABOVE CALCULATIONS =				\$990.00			
Reduction by 1/2 for filing by small entity, if applicable.				\$			
SUBTOTAL =				\$990.00			
Processing fee of \$130.00 for furnishing the English translation later than <input checked="" type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$130.00			
TOTAL NATIONAL FEE =				\$1,120.00			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$0.00			
TOTAL FEES ENCLOSED =				\$1,120.00			
				Amount to be:			
				refunded \$			
				charged \$			
a. <input checked="" type="checkbox"/> A check in the amount of \$1,120.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. <u>22-0185</u> in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Director is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>22-0185</u> . A duplicate copy of this sheet is enclosed.							
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b) must be filed and granted to restore the application to pending status SEND ALL CORRESPONDENCE TO:							
Connolly Bove Lodge & Hutz LLP 1990 M Street, N.W., Suite 800 Washington, DC 20036-3425			 SIGNATURE Morris Liss NAME 24,510 REGISTRATION NUMBER				

09/857106 "0022"

#5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Cécile Vacher



Serial No.: 09/857,106

Art Unit: To be assigned

Filed: June 1, 2001

Examiner: To be assigned

For: TORQUE CONTROL
SYSTEM OF PARALLEL
HYBRID POWERING

Atty Docket: 21788/0028

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-captioned case as follows.

IN THE CLAIMS

Kindly amend claims 3 and 4 to read as follows:

3. (Amended) System as set forth in claim 1, wherein it comprises means that cool the motor-driven engine group, such as a fan, adapted to receive that the input at least a portion of the Boolean information generated by the means that determine the state of the motor-driven engine group.

4. (Amended) System as set forth in claim 1, wherein the engine [(2)] consists of an alternator and a starter.

09/857,106-082701



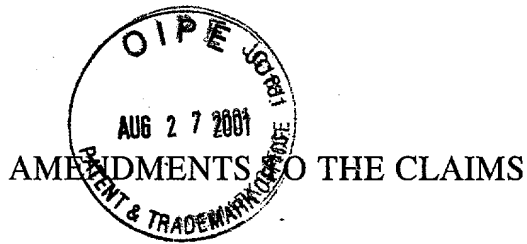
The claims have been amended to eliminate multiple dependency and to improve their format. None of these amendments is believed to involve any new matter. Accordingly, it is respectfully requested that the foregoing amendments be entered, that the application as so amended receive an examination on the merits, and that the claims as now presented receive an early allowance.

Respectfully submitted,

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Telephone: 202-331-7111

Date: 8/2/01

09/857,106-082701



3. (Amended) System as set forth in [any one of the previous claims] claim 1, [characterized by the fact that] wherein it [is comprised of] comprises means [(13)] that cool the motor-driven engine group [(1, 2)], such as a fan, adapted to receive that the input at least a portion of the Boolean information generated by the means [(9)] that determine the state of the motor-driven engine group.

4. (Amended) System as set forth in [any one of the previous claims] claim 1, [characterized by the fact that] wherein the engine [(2)] consists of an alternator and a starter.

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Parallel hybrid motorization torque control system

This patent relates to a parallel hybrid motorization torque control system for motor vehicles.

More specifically it pertains to a torque control system for heat or electric engines that make up the parallel hybrid motorization, in particular for an alternator starter.

A few definitions are provided hereafter. Parallel hybrids are motor-driven engine groups in which a heat engine, an electric engine powered by a storage battery and a mechanical transmission are coupled using a device that makes it possible to link them to each other in rotation. Where the electric engine is likely to function as either a motor or as a current generator. This type of motorization has the advantage of being able to use both types of power, thermal and electric, alternatively or simultaneously. The switch from one operational configuration to the other is carried out by means of control that handle all control and power management functions.

The alternator-starter is a specific parallel hybrid that consists of an electronically managed electric engine, placed between the engine and the gearbox and that replaces the starter, the alternator and the traditional engine flywheel. This type of hybrid also consists of two batteries, a utility battery used to power the electrical network in particular during the taxiing phase and a power battery used mainly to supply energy to the electric engine.

It turns out that in such a motor-driven engine group, many parameters can influence the electric and heat engines' torque requirements. These various parameters change with the advances in technology or the regulatory limitations in such a way that it is necessary to completely review the torque control system when such changes take place.

The object of the invention is to remedy this situation and in particular to propose a torque control system for a vehicle equipped with a parallel hybrid motor-driven engine group of the above-mentioned type and whose architecture has potential for change.

With this end in view, the object of the invention is a parallel hybrid motor-driven engine group torque control system for a motor vehicle, where the hybrid motor-driven engine group consists of an electric engine and a heat engine linked together in rotation to a mechanical chain adapted so as to allow the two engines to provide, either alternatively or simultaneously, engine power to the wheels of the vehicle, characterized by the fact that it consists of:

- means that can determine the state of the vehicle;
- means that can manage the methods of operation of the hybrid motor-driven engine group adapted to receive, at the input, a portion of the Boolean or non-Boolean data from the means that determine the state of the vehicle;
- means that can help the dynamic performance of the vehicle, adapted to receive, at the input, the other portion of the Boolean or non-Boolean data from the means that determine the state of the vehicle;
- means that manage the electric power available for the vehicle;
- means that determine the state of the motor-driven engine group;
- means that constantly determine the total engine torque (C_m) to be provided to the vehicle's wheels, adapted to receive, at the input, the Boolean or non Boolean data from the means that manage and assist and the data from the means that determine the state of the motor-driven engine group, by giving priority to the data obtained from the means that manage and assist, in order to respectively control the torque (C_e) of the

electric engine and the torque (C_t) of the heat engine based on the desired (C_e) / (C_t) ratio.

In the context of the invention "Engine power" means the product of the engine torque and the engine speed that is provided either alternatively or simultaneously by the heat and the electric engine.

Similarly, by "means that determine the state of the vehicle", we mean the means that make it possible to analyze the Boolean or non Boolean data provided by the sensors located on the vehicle. For example, the information provided will be the speed of the vehicle, the speed of the heat engine, the gear ratio ...

By "means that assist the dynamic performance", we mean calculation means that make it possible to improve the use of the engine brake (motor-driven engine group), to improve the heat engine's anti-stalling and the dynamic compensation torque when climbing.

By "means that manage the methods of operation of the motor-driven engine group", we mean the means that make it possible to start or not start the heat and/or electric engine and to fine tune the torque (C_m) that is to be transmitted to the vehicle's wheels when restarting the vehicle in circulation, usually called "stop and start".

Advantageously, the system as set forth in the invention consists of a man /engine interface adapted in such a way that it can receive, at the input, the Boolean data provided by the means that determine the state of the motor-driven engine group and can provide, at the output, certain visual data to the driver in order to allow him/her to chose a method of operation of the motor-driven engine group.

According to one attractive characteristic of the invention, the system consists of means that can cool the motor-driven engine group, such as a fan, adapted to receive, at

the input, at least a portion of the Boolean or non Boolean data provided by the means that determine the state of the motor-driven engine group.

Preferably, the electric engine is comprised of an alternator and of a starter.

The main advantage of such a system is its upgradeable architecture. Indeed, it is easily possible to modify any means as they are set forth in the invention independently from each other if the electric engine of the motor-driven engine group or at least one battery changes, if the heat engine of the motor-driven engine group and/or the desired hybridization rate (Cth/Ce) changes or if the driver's desired conditions change in order to restart a stationary motor-driven engine group.

Advantageously, such a system also makes it possible to use a modular architecture. Indeed, it is possible to place it on a vehicle equipped with a motor-driven engine group that is only equipped with a heat engine.

Lastly, it makes it possible to conserve a lot of energy as it makes possible an undersizing of the heat engine and/or an extension of the axle ratios called "downsizing" while maintaining, if not improving, the dynamic performance of a high power engine or a traditional chain.

The above-mentioned characteristics of the invention, as well as other characteristics, will become clearer after having read the following description and analyzed the attached drawing in which the only figure represents a block diagram that illustrates an example of execution of a torque control system for an alternator-starter as set forth in this invention.

In this only figure, we recognize an electric engine 1 and a heat engine 3, both connected in rotation to a mechanical chain 3 that allows both engines to selectively provide the engine power to the wheels 4 of the vehicle.

Each of the two engines, electric 1 and heat 2, are respectively connected to a torque control system 5, as set forth in this invention, in order to regulate the torque of each one of them based on the life situations of the motor vehicle.

Advantageously, the torque control system of the electric 1 and heat 2 engines as set forth in the invention, is mainly comprised of a torque management unit 6 linked to the starting and stopping of the engine or the heat engine 2, a management unit for the autonomy of the electrical energy 7, a unit that determines the life situation of the vehicle 8, a unit that determines the life situation of the overall device comprised of the alternator-starter system and its central or monitoring control 9, and a unit that determines the torque 10 that receives, at the input, information provided by the various other units in order to respectively control the torque C_e of the electric engine 1 and the torque C_t of the heat engine 2.

Furthermore, the system 5 can also consist of a man/engine interface 11 that is connected to the vehicle's central monitor, not represented, in order to warn the driver and the vehicle's other systems of the state of the alternator-starter system, and allow the driver to chose the method of operation of the alternator-starter system, a torque management unit 12 connected to the dynamic performance assistance, and a cooling management unit 13 that receives, at the input, the temperature T data of the electric engine and the water data of the heat engine.

We will successively describe the function of each of the units that make up the torque control system as set forth in the invention.

The torque management unit 6, connected to the starting and stopping of the engine, analyzes the heat engine control state information in order to establish the state of the motor-driven engine group on the one hand, the final conditions of an authorization to perform a stop or request a start up on the other hand, from information transmitted in particular through the unit that determines the life situation of the vehicle 8. This unit coordinates the calculation of the torque instructions to be performed by the electric

engine 1 and the orders to the heat engine control 2 to start or stop the engine. The electrical torque to be applied to the shaft to start or stop the heat engine is calculated by controlling the speed on the slow down instruction. This unit also determines the heat conditions, namely cold start, for the engine that contributes to the evaluation of the necessary electrical power. The management unit for the range of the electrical power 7 that calculates the available electrical power implements the coherent actions, among others the piloting of converters or the choice of start up by the traditional starter, so as to deliver the necessary energy during start up.

This energy management unit 7 is designed to mainly transmit six pieces of information to the torque determination unit 10 that drives the electric engine 1 and the heat engine 2, respectively: evaluation, the desirable generation torque to maximize the vehicle's electric power, the maximum power feasible in traction, the evaluation of the maximum allowable generation power, the authorization to make a stop or to request a start of the heat engine, and the state and type of the charge, based on the information generated for the most part by the power battery that supplies the electric engine and where appropriate, as supplementary power, utility batteries that supply the low voltage system of distribution.

The unit that determines the life situation of the vehicle 8 synthesizes the information generated by the vehicles sensors on the one hand (driver presence sensor, neutral sensor...) and by the dialog with other devices on the other hand, including the driver's wishes by synthesizing in particular the position of the clutch, the accelerator, the vehicle's speed and the gear ratio in order to determine the authorization for a possible cut-off of the heat engine toward the management function of the motor-driven engine group 6, or the identification of an activation of compensation of the heat engine transients toward the dynamic performance torque management function, such as assistance when maneuvering.

All this information, torque instructions, generated or in the engine, obtained from the torque allocation or request management units 6, 7 and 12 for a device or an identified

function as defined above and the states or alerts of these same functions are transmitted to the unit that determines the torque 10. On the other hand, the unit that determines the life situation of the alternator-starter system 9 transmits the information pertaining to its life situation to the unit that determines the torque 10 making it possible to establish the final torque instruction distributed between the heat engine on the one hand and the electric engine of the other hand, allocating, based on the life case, the priority to the management functions of the motor-driven engine group 6, the electric autonomy 7 or the dynamic performance 12.

A man/engine interface can advantageously be included in the system as set forth in the invention in order to constantly inform the driver and the other vehicle's devices of the life situations of the alternator-starter system and to acquire the driver's choices of operation.

Similarly, in an advantageous manner, a torque management unit 12, connected to the dynamic performance assistance, can be included in the system in order to calculate the heat engine transient compensation torque instructions, the regenerative and anti-stalling braking, using in particular the information generated by the unit that determines the life situation of the vehicle 8, as well as the torque and the speed performed by the heat engine. Based on this variable, the electric torque to be applied in order to avoid stalling the engine is generated by a servo calculation of the engine speed when idling. As for the torque to be applied, in particular in the case of a down-sizing heat engine, it is calculated using the sum of the torques of the two engines, heat and electric, and the driver torque instruction.

Advantageously, a cooling unit 13 guarantees the start-up of a fan based on heat engine temperature and utility and power battery criteria.

We can thus foresee that such a system would be upgradeable since a torque request function (pull or generation) can easily be added. Similarly, any unit can be modified, with fixed interfaces, independently from the other units in case of a change in the

electric engine, the heat engine and possibly the vehicle's stop orders or requests for start-up.

Furthermore, the arrangement of the above-described system makes it possible to make adjustments regardless of the number of power batteries.

It of course goes without saying that various methods of operation of such a system are possible.

CLAIMS

1. Torque control system for a parallel hybrid motor-driven engine group for motor vehicles, in which the hybrid motor-driven engine group includes an electric engine (1) and a heat engine (2) connected in rotation to a mechanical chain (3) adapted so as to allow the two engines to alternatively or simultaneously provide a drive force to the wheels (4) of the vehicle, characterized by the fact that it is comprised of:

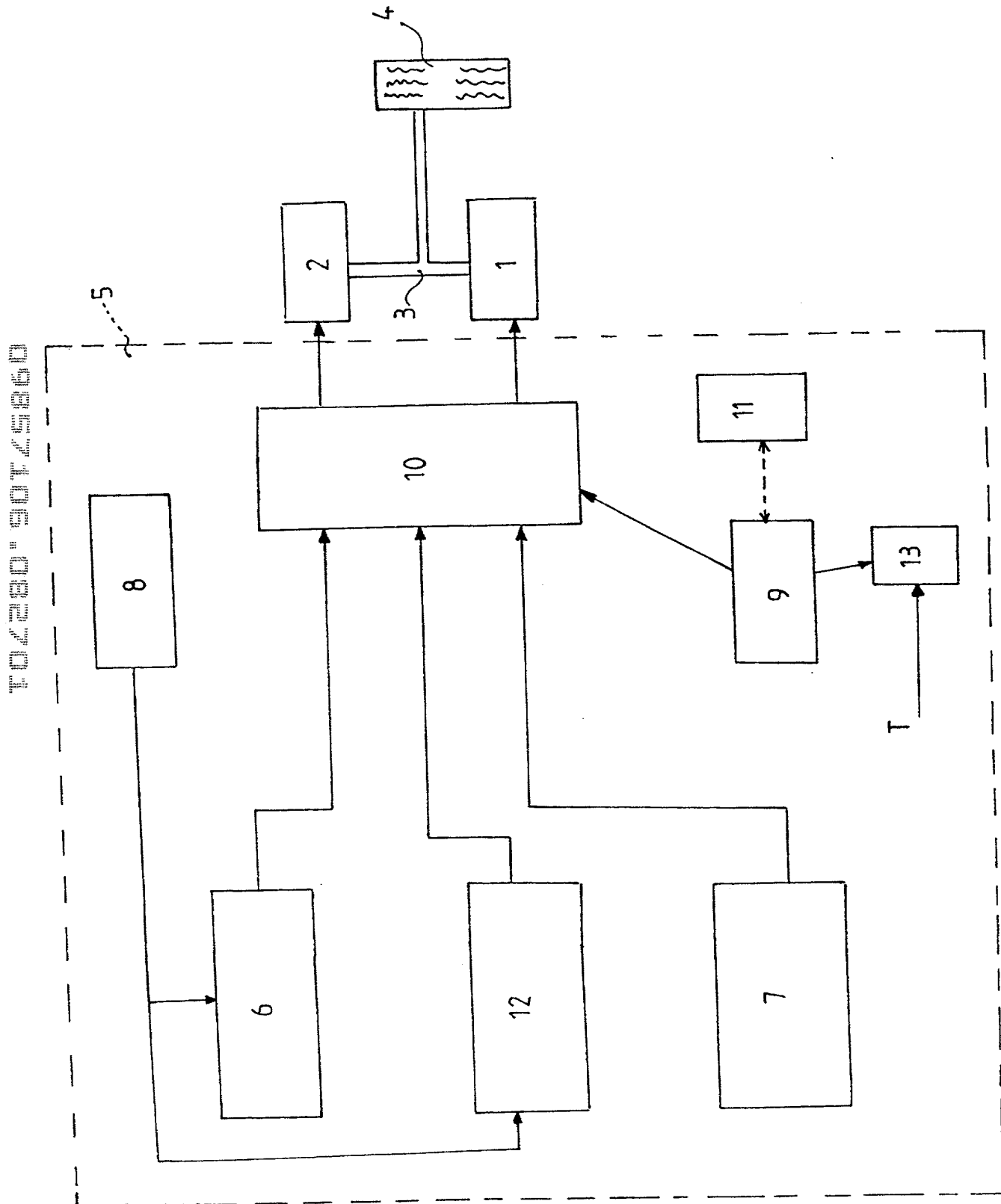
- means (8) that determine the state of the vehicle;
- means (6) that manage the methods of operation of the hybrid motor-driven engine group and adapted to receive, at the input, a portion of the Boolean or non-Boolean information generated by the means (8) that determine the state of the vehicle;
- means (12) that assist the dynamic performance of the vehicle and adapted to receive, at the input, the other portion of the Boolean or non Boolean information generated by the means (8) that determine the state of the vehicle;
- means (7) that manage the electric power available to the vehicle;
- means (9) that determine the state of the motor-driven engine group;
- means (10) that constantly determine the total engine torque (C_m) to be provided to the wheels of the vehicle, adapted to receive at the input the Boolean or non Boolean information generated by the means that manage and assist (6, 7, 12) and those generated by the means (9) that determine the state of the motor-driven engine group, while giving priority to those generated by the management and assistance means (6, 7, 12) in order to respectively control the torque (C_e) of the electric engine (1) and the torque (C_t) of the heat engine (2) based on the desired (C_e)/(C_t) ratio.

2. System as set forth in claim 1, characterized by the fact that it comprises a man/engine interface (11) adapted to receive at the input, the Boolean or non Boolean

information generated by the means (9) that determine the state of the motor-driven engine group and to provide in particular at the output, visual information to the driver thus allowing him to chose a method of operation of the motor-driven engine group.

3. System as set forth in any one of the previous claims, characterized by the fact that it is comprised of means (13) that cool the motor-driven engine group (1, 2), such as a fan, adapted to receive at the input at least a portion of the Boolean information generated by the means (9) that determine the state of the motor-driven engine group.

4. System as set forth in any one of the previous claims, characterized by the fact that the electric engine (2) consists of an alternator and a starter.



DECLARATION FOR PATENT APPLICATION

1788/00028

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TORQUE CONTROL SYSTEM OF PARALLEL HYBRID POWERING

the specification of which: (check one)

☐ is attached hereto.☒ was filed on September 29, 2000, as PCT International Application Number PCT/FR00/02709, and was filed in the U.S. Patent and Trademark Office on June 1, 2001 and was amended on _____ 19__ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 CFR § 1.56(a).

Prior Foreign Application(s): I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate listed below, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

			Priority Claimed	
99 12300	France	1/October/1999	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Application No.)	(Country)	(Day/Month/Year Filed)	YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>
(Application No.)	(Country)	(Day/Month/Year Filed)	YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>
(Application No.)	(Country)	(Day/Month/Year Filed)	YES	NO

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

Application No.	Filing Date
_____	_____

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below or 34 U.S.C. § 365(c) of any PCT International Application designating the United States of America listed below, and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application or PCT application in the manner provided by 35 U.S.C. § 112, first paragraph, I acknowledge the duty to disclose material information as defined in 37 CFR § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(U.S. or PCT Application Serial No.)	(U.S. or PCT Filing Date)	(Status - patented, pending, abandoned)
_____	_____	_____
(U.S. or PCT Application Serial No.)	(U.S. or PCT Filing Date)	(Status - patented, pending, abandoned)
_____	_____	_____

I hereby appoint the following registered practitioners: Rudolf E. Hutz, Reg. No. 22,397; John D. Fairchild, Reg. No. 19,756; Harold Pezzner, Reg. No. 22,112; Richard M. Beck, Reg. No. 22,580; Paul E. Crawford, Reg. No. 24,397; Burton A. Amernick, Reg. No. 24,852; Morris Liss, Reg. No. 24,510; George R. Pettit, Reg. No. 27,369; Patricia Smink Rogowski, Reg. No. 33,791; Robert G. McMorrow, Jr., Reg. No. 30,962; Ashley I. Pezzner, Reg. No. 35,646; William E. McShane, Reg. No. 32,707; Mary W. Bourke, Reg. No. 30,982; Gerard M. O'Rourke, Reg. No. 39,794; James M. Olsen, Reg. No. 40,408; Francis DiGiovanni, Reg. No. 37,310; Eric J. Evain, Reg. No. 42,517; Daniel C. Mulveny, Reg. No. 45,897; John A. Evans, (Agent) 44,100; and Elliot C. Mendelson (Agent), Reg. No. 42,878, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Send Correspondence and Direct Telephone Calls to:

Morris Liss
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Cécile Vacher

Inventor's Signature

Residence Address

Citizenship

Post Office Address

☐ See next page for additional inventors

Date

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FRX

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Same as above

13/06/2001